CLAIMS

What is claimed is:

1. A method of managing loading of a reverse link in a wireless communication network, the method comprising:

serving a plurality of mobile stations on the reverse link, including mobile stations that are members of a first set of mobile stations that are allowed to adjust their reverse link data rates responsive to common rate control commands being broadcast by the network;

receiving feedback from each mobile station in the first set indicating whether the reverse link data rate of the mobile station is mobile-limited or is command-limited;

adding one or more new members to the first set if the reverse link data rates of more than a defined fraction of mobile stations in the first set are mobile-limited; and

subtracting one or more current members from the first set if the reverse link data rates of more than a defined fraction of mobile stations are command-limited.

2. The method of claim 1, further comprising maintaining an activity factor for each mobile station in the plurality of mobile stations that indicates its membership time in the first set, and selectively adjusting membership in the first set based on a goal of equalizing the activity factors.

3. The method of claim 2, wherein selectively adjusting membership in the first set based on a goal of equalizing the activity factors comprises selecting particular ones of the mobile stations for movement out of the first set by ranking mobile stations in the first set according to their activity factors and moving one or more highest ranked ones of them out of the first set.

4. The method of claim 2, wherein selectively adjusting membership in the first set based on a goal of equalizing the activity factors comprises selecting particular ones of the mobile stations for movement into the first set by ranking mobile stations currently not in the first set according to their activity factors and moving one or more lowest ranked ones of them into the first set.

5. The method of claim 2, wherein selectively adjusting membership in the first set based on a goal of equalizing the activity factors comprises:

periodically comparing a maximum one of the activity factors for mobile stations in the first set to a minimum one of the activity factors for mobile stations not in the first set; and

if the comparison indicates a greater than desired disparity in activity factors, removing the mobile station having the highest activity factor from the first set, and adding the mobile station having the lowest activity factor to the first set.

6. The method of claim 1, further comprising switching one or more mobile stations in the first set with one or more mobile stations not in the first set based on a goal of equalizing an amount of membership time in the first set for all mobile stations.

7. The method of claim 1, wherein serving a plurality of mobile stations on the reverse link comprises maintaining a data session for each of the plurality of mobile stations.

8. The method of claim 1, wherein receiving feedback from each mobile station in the first set indicating whether the reverse link data rate of the mobile station is mobile-limited or is command-limited comprises receiving a status indicator from the mobile station that has a first defined value if the reverse link data rate is mobile-limited, and that has a second defined value if the reverse link data rate is command-limited.

9. The method of claim 8, wherein adding one or more new members to the first set if the reverse link data rates of more than a defined fraction of mobile stations in the first set are mobile-limited comprises adding one or more new members to the first set if an average of the status indicators indicates that the reverse link data rates of a high percentage of mobile stations in the first set are mobile-limited.

10. The method of claim 8, wherein subtracting one or more current members from the first set if the reverse link data rates of more than a defined fraction of mobile stations in the first set are command-limited comprises subtracting one or more new members from the first set if an average of the status indicators indicates that the reverse link data rates of a high percentage of mobile stations in the first set are command-limited.

11. The method of claim 8, wherein receiving a status indicator from the mobile station that has a first defined value if the reverse link data rate is mobile-limited, and that has a second defined value if the reverse link data rate is command-limited comprises receiving a logical "1" value to indicate a mobile-limited status and a logical "0" value to indicate a command-limited status.

12. The method of claim 1, further comprising maintaining an activity factor for each mobile station in the plurality of mobile stations that indicates its membership time in the first set.

13. The method of claim 12, further comprising controlling membership in the first set based on maintaining the activity factor of each mobile station substantially at a target value determined by a user class designation of the mobile station.

14. The method of claim 12, further comprising controlling membership in the first set based on maintaining the activity factors of one or more mobile stations at one or more target values determined by Quality-of-Service (QoS) constraints associated with the one or more mobile stations.

15. The method of claim 12, further comprising controlling admissions of new mobile stations to the plurality of mobile stations based on the activity factors.

16. The method of claim 15, wherein controlling admissions of new mobile stations to the plurality of mobile stations based on the activity factors comprises blocking or deferring new mobile stations from admission if an average of the activity factors of the plurality of mobile stations is below a defined threshold.

17. The method of claim 1, further comprising adjusting membership in the first set based on Quality-of-Service (QoS) constraints associated with one or more of the mobile stations.

18. A method of managing loading of a reverse link in a wireless communication network, the method comprising:

assigning selected ones in a plurality of mobile stations as members in a set of rate-controlled mobile stations;

broadcasting rate control commands to adjust reverse link data rates of the rate-controlled mobile stations and thereby affect reverse link loading by the rate-controlled mobile stations; and

adjusting membership in the set of rate-controlled mobile stations if a targeted reverse link loading cannot be substantially maintained by broadcasting the rate control commands.

19. The method of claim 18, wherein assigning selected ones in a plurality of mobile stations as members in a set of rate-controlled mobile stations comprises determining a minimum number of mobile stations to achieve the targeted reverse link loading and thereby minimize the number of mobile stations simultaneously transmitting on the reverse link.

20. The method of claim 19, wherein determining a minimum number of mobile stations to achieve the targeted reverse link loading and thereby minimize the number of mobile stations simultaneously transmitting on the reverse link comprises ranking mobile stations according to a throughput metric and selecting individual ones of them in rank order for assignment to the set of rate-controlled mobile stations until a projected reverse link loading of the selected mobile stations is substantially at the targeted reverse link loading.

21. The method of claim 18, wherein assigning selected ones in a plurality of mobile stations as members in a set of rate-controlled mobile stations comprises sending assignment messages to each of the selected mobile stations to indicate its assignment to the set of rate-controlled mobile stations.

22. The method of claim 21, wherein adjusting membership in the set of rate-controlled mobile stations if a targeted reverse link loading cannot be substantially maintained via the rate control commands comprises at least one of sending assignment messages to one or more currently unassigned mobile stations and sending un-assignment messages to one or more currently assigned mobile stations.

23. The method of claim 18, wherein adjusting membership in the set of rate-controlled mobile stations if a targeted reverse link loading cannot be substantially maintained by broadcasting the rate control commands comprises determining either that the reverse-link data rates of a high fraction of rate-controlled mobile stations are command-limited or are mobile-limited.

24. The method of claim 23, wherein determining either that the reverse-link data rates of a high fraction of rate-controlled mobile stations are command-limited or are mobile-limited comprises:

receiving a status indicator from each rate-controlled mobile station that indicates whether its reverse link data rate currently is command-limited or is mobile-limited; and

evaluating the status indicators.

25. The method of claim 24, wherein evaluating the status indicators comprises determining an average of them.

26. The method of claim 18, further comprising adjusting membership in the set of rate-controlled mobile stations based on a fairness goal.

27. The method of claim 18, further comprising adjusting membership in the set of rate-controlled mobile stations based on a goal of equalizing membership times in the set of rate-controlled mobile stations for all mobile stations in the plurality of mobile stations.

28. The method of claim 18, further comprising maintaining an activity factor for each mobile station in the plurality of mobile stations that indicates its membership time in the set of rate-controlled mobile stations.

29. The method of claim 28, further comprising controlling membership in the set of rate-controlled mobile stations based on maintaining the activity factor of each mobile station substantially at a target value determined by a user class designation of the mobile station.

30. The method of claim 28, further comprising controlling membership in the set of rate-controlled mobile stations based on maintaining the activity factors of one or more mobile stations at one or more target values determined by Quality-of-Service (QoS) constraints associated with the one or more mobile stations.

31. The method of claim 28, further comprising controlling admissions of new mobile stations to the plurality of mobile stations based on the activity factors.

32. The method of claim 31, wherein controlling admissions of new mobile stations to the plurality of mobile stations based on the activity factors comprises blocking or deferring new mobile stations from admission if an average of the activity factors of the plurality of mobile stations is below a defined threshold.

33. A method of reverse link rate control in a mobile station for use in a wireless communication network, the method comprising:

responding to the rate control commands if in a first mode;

not responding to the rate control commands if in second mode; and

operating in the first mode or the second mode according to an indication received from the network.

34. The method of claim 33, wherein responding to the rate control commands if in a first mode comprises adjusting a reverse link data rate responsive to the rate control commands.

35. The method of claim 33, wherein not responding to the rate control commands comprises setting a reverse link data rate to a defined minimum rate.

36. The method of claim 33, further comprising, if in the first mode, transmitting status indicators to the network to indicate whether the mobile station is mobile-limited, meaning that it cannot increase its data rate because of one or more conditions at the mobile station, or is command-limited, meaning that it could increase its reverse link data rate but for the common rate control commands indicating that it should not.

37. The method of claim 33, further comprising, if in the first mode, providing feedback to the network indicating whether the reverse link data rate of the mobile station is mobile-limited or command-limited.

38. The method of claim 37, wherein providing feedback to the network indicating whether the reverse link data rate of the mobile station is mobile-limited or command-limited comprises returning a first value to the network to indicate that the mobile station could not increase its reverse link data responsive to receiving an up rate control command from the network.

39. The method of claim 37, wherein providing feedback to the network indicating whether the reverse link data rate of the mobile station is mobile-limited or command-limited comprises returning a second value to the network to indicate that the mobile station could increase its reverse link data responsive to receiving a down or hold rate control command from the network.

40. A base station for use in wireless communication network comprising:

transceiver circuits to send signals to a plurality of mobile stations on a forward link and receive signals from the mobile stations on a reverse link;

processing logic including a load controller configured to generate rate control commands for a first set of mobile stations in the plurality of mobile stations based on a reverse link loading, and further configured to:

receive feedback from each mobile station in the first set indicating whether the reverse link data rate of the mobile station is mobile-limited or is command-limited;

add one or more new members to the first set if the reverse link data rates of more than a defined fraction of mobile stations in the first set are mobile-limited; and

subtract one or more current members from the first set if the reverse link data rates of more than a defined fraction of mobile stations are command-limited.

41. The base station of claim 40, wherein the load controller is configured to maintain an activity factor for each mobile station in the plurality of mobile stations that indicates its membership time in the first set, and selectively adjust membership in the first set based on a goal of equalizing the activity factors.

42. The base station of claim 41, wherein the load controller is configured to selectively adjust membership in the first set by ranking mobile stations in the first set according to their activity factors and moving one or more highest ranked ones of them out of the first set.

43. The base station of claim 41, wherein the load controller is configured to selectively adjust membership in the first set by ranking mobile stations currently not in the first set according to their activity factors and moving one or more lowest ranked ones of them into the first set.

44. The base station of claim 41, wherein the load controller is configured to selectively adjust membership in the first set by periodically comparing a maximum one of the activity factors for mobile stations in the first set to a minimum one of the activity factors for mobile stations not in the first set, and if the comparison indicates a greater than desired disparity in activity factors, removing the mobile station having the maximum activity factor from the first set, and adding the mobile station having the minimum activity factor to the first set.

45. The base station of claim 40, wherein the load controller is configured to switch one or more mobile stations in the first set with one or more mobile stations not in the first set based on a goal of equalizing an amount of membership time in the first set for all mobile stations.

46. The base station of claim 40, wherein the load controller is configured to receive feedback from each mobile station in the first set based on the base station periodically receiving a status indicator from each mobile station that has a first defined value if the reverse link data rate is mobile-limited, and that has a second defined value if the reverse link data rate is command-limited.

47. The base station of claim 46, wherein the load controller is configured to add one or more new members to the first set if the reverse link data rates of more than a defined fraction of mobile stations in the first set are mobile-limited responsive to determining that an average of the status indicators indicates that the reverse link data rates of a high percentage of mobile stations in the first set are mobile-limited.

48. The base station of claim 46, wherein the load controller is configured to subtract one or more current members from the first set if the reverse link data rates of more than a defined fraction of mobile stations in the first set are command-limited responsive to determining that an average of the status indicators indicates that the reverse link data rates of a high percentage of mobile stations in the first set are command-limited.

49. The base station of claim 46, wherein the load controller is configured to determine whether the status indicators fed back from each mobile station in the first set are a logical "1" value to indicate a mobile-limited status or a logical "0" value to indicate a command-limited status.

50. The base station of claim 40, wherein the load controller is configured to assign a particular mobile station to the first set by causing a first signaling message to be sent from the base station to that particular mobile station, and to remove a particular mobile station from the first set by causing a second signal message to be sent from the base station to that particular mobile station.

51. The base station of claim 40, wherein the load controller is configured to compose the first set of mobile stations based on a goal of achieving a desired reverse link loading with a minimal number of mobile stations in the first set.

52. The base station of claim 40, wherein the load controller is configured to maintain an activity factor for each mobile station in the plurality of mobile stations that indicates its membership time in the first set.

53. The base station of claim 52, wherein the load controller is configured to control membership in the first set based on maintaining the activity factor of each mobile station substantially at a target value determined by a user class designation of the mobile station.

54. The base station of claim 52, wherein the load controller is configured to control membership in the first set based on maintaining the activity factors of one or more mobile stations at one or more target values determined by Quality-of-Service (QoS) constraints associated with the one or more mobile stations.

55. The base station of claim 52, wherein the base station is configured to control admissions of new mobile stations to the plurality of mobile stations based on the activity factors maintained by the load controller.

56. The base station of claim 55, wherein the base station is configured to control admissions of new mobile stations to the plurality of mobile stations based on the activity factors maintained by the load controller based on blocking or deferring new mobile stations from admission if an average of the activity factors of the plurality of mobile stations is below a defined threshold.